STATE OF ALABAMA
SURFACE MINING COMMISSION

Permit Number:P- 3943 -07-15-S

License Number:L- 766

PERMIT TO ENGAGE IN SURFACE COAL MINING OPERATIONS

Pursuant to **The Alabama Surface Mining Control and Reclamation Act of 1981**, as amended, **ALA. Code** Section 9-16-70 et. seq. (1975) a permit to engage in Surface Coal Mining Operations in the State of Alabama is hereby granted to:

TACOA MINERALS LLC
1669 MISSION HILLS ROAD
ALABASTER AL 35007
(PIPER MINE)

Such operations are restricted to 285 * acres as defined on the permit map and located in: (See Condition #3)

SEE LEGAL DESCRIPTION (ATTACHED)

This permit is subject to suspension or revocation upon violation of any of the following conditions:

1. The permittee shall conduct Surface Coal Mining and Reclamation Operations in accordance with the plans, provisions and schedules in the permit application.

2. The permittee shall conduct operations in a manner to prevent damage or harm to the environment and public health and safety and shall notify ASMC and the public in accordance with ASMC Rule 880-X-8K-.16 of any condition which threatens the environment or public health and safety.

LEGAL DESCRIPTION

NW/NE, SW/NE, SE/NW, NE/SW, NW/SW, SW/SW, SW/NW, NW/NW, NE/NW OF SECTION 13, NE/NE, NW/NE, SW/NE, SE/NE, NE/SE, SE/SE, SW/SE, NW/SE, SE/NW, NE/SW, SE/SW OF SECTION 14, NW/NW, SW/NW, SE/NW, NE/NW, NE/SW, NW/SW, SW/SW, SE/SW, SW/SE, NW/SE, NE/SE, SE/NE, SW/NE, NW/NE, NE/NE OF SECTION 23, ALL IN TOWNSHIP 22 SOUTH, RANGE 5 WEST, ALL IN BIBB COUNTY, ALABAMA

3. Surface coal mining operations are restricted to those areas for which sufficient bond has been posted with ASMC. On the date of issuance of this permit, bond was posted only for increment #1 consisting of 41 acres as defined on the permit map.

4. No mining disturbance is to occur on any part of the permit on which legal "right of entry" has not been obtained. When such rights are "pending" the applicant shall submit acceptable evidence, to the Director, that such rights have been obtained according to ASMC Regulation 880-X-8D-.07.

5. No disturbance is to occur on any properties on which land use comments from legal owners of record are "pending" prior to the applicant providing acceptable comments.

6. No disturbance is to occur in the 300' setback area to any occupied dwelling prior to the applicant providing acceptable evidence to ASMC of its having secured a waiver of each subject area signed by the owner of the dwelling.

7. No mining disturbance shall occur within the 100' setback of any public road or the relocation of any public road prior to the applicant providing acceptable evidence, to the Director, of its having secured approval for a waiver from the appropriate jurisdictional authority and specific written waiver from ASMC.

8. The permittee shall notify the ASMC and seek consultation with the US Fish and Wildlife Service if:

   a. The permit is modified in any way that causes an effect on species or Critical Habitat listed under the Endangered Species Act of 1973.
   b. New information reveals the operation may affect Federally protected species or designated Critical Habitat in a manner or extent not previously considered or
   c. A new species is listed or Critical Habitat is designated under the Endangered Species Act that may be affected by the operation.

9. The permittee shall contact the ASMC and consult with the Alabama Historic Preservation Officer if the permit is modified or if previously unknown archaeological or historic resources or human remains are discovered on the permit area. Upon discovery of previously unknown artifacts or archaeological features the permittee shall cease operations until the Alabama Historic Preservation Officer approves resumption of operations.

DATE ISSUED: JUNE 4, 2010
EFFECTIVE DATE: JUNE 4, 2010
EXPIRATION DATE: JUNE 3, 2015

/ns

Randall C. Johnson, Director

FINDINGS

PERMIT NO.: P-3943-07-15-S

The ASMC, acting by and through its Director, hereby finds, on the basis of information set forth in the application or from information otherwise available, that --

1. The permit application is complete and accurate and the applicant has complied with all requirements of the Act and the regulatory program.

2. The applicant has demonstrated that reclamation as required by the Act and the regulatory program can be accomplished under the reclamation plan contained in the permit application.

3. The proposed permit area is:

   (a) Not within an area under study or administrative proceedings under a petition, filed pursuant to Chapter 880-X-7 to have an area designated as unsuitable for surface coal mining operations;

   (b) Not within an area designated as unsuitable for mining pursuant to Chapter 880-X-7 or subject to the prohibitions or limitations of Section 880-X-7B.-06 and Section 880-X-7B-.07 of this chapter; or

4. For mining operations where the private mineral estate to be mined has been severed from the private surface estate, the applicant has submitted to the Regulatory Authority the documentation required under Section 880-X-8D.07 and Section 880-X-8G-.07 of this chapter.

5. The Regulatory Authority has made an assessment of the probable cumulative impacts of all anticipated coal mining on the hydrologic balance in the cumulative impact area and has determined that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.

6. The applicant has demonstrated that any existing structure will comply with Section 880-X-2B-.01, and the applicable performance standards of Chapter 3 or 10.

7. The applicant has paid all reclamation fees from previous and existing operations as required by 30 C.F.R., Subchapter R.

8. The applicant has satisfied the applicable requirements of Subchapter 880-X-8J.

9. The applicant has, if applicable, satisfied the requirements for approval of a long-term, intensive agricultural, postmining land use, in accordance with the requirements of 880-X-l0C-.58(4) and 880-X-10D-.52(4).

10. The operation will not affect the continued existence of endangered or threatened species, or result in destruction or adverse modification of their critical habitats, as determined under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.).

11. The Regulatory Authority has taken into account the effect of the proposed permitting action on properties listed or eligible for listing on the National Register of Historic Places. This finding is supported in part by inclusion of appropriate permit conditions or changes in the operation plan protecting historic resources, or a documented decision that the Regulatory Authority has determined that no additional protection measures are necessary.

12. For a proposed remining operation where the applicant intends to reclaim in accordance with the requirements of Section 880-X-l0C-.56 or 880-X-10D.-49, the site of the operation is a previously mined area as defined in Section 880-X-2A-.06.

l3. Surface coal mining and reclamation operations will not adversely affect a cemetery.

l4. After application approval but prior to issue of permit, ASMC reconsidered its approval, based on the compliance review required by Section 880-X-8K-.10(2)(a) in light of any new information submitted under 880-X-8D-.05(8).

l5. The applicant has submitted the performance bond or other equivalent guarantee required under Chapter 880-X-9 of the ASMC Rules prior to the issuance of the permit.

16. For mining operations where a waiver is granted from the 100' setback from a public road according to 880-X-7B-.07, the interests of the public and affected landowners have been protected.

17. The Regulatory Authority has taken into account the effect of the proposed permitting action on properties listed or eligible for listing on the National Register of Historic Places. Site surveys performed by PE Lamoreaux and Associates dated June 22, 2008 and October 19, 2009 found no sites potentially eligible for listing on the National Register of Historic Places located on the mine site. The State Historic Preservation Officer (SHPO) concurred with these findings by letter dated November 12, 2009. This finding is supported in part by inclusion of appropriate permit conditions or changes in the operation plan protecting historic resources, or a documented decision that the Regulatory Authority has determined that no additional protection measures are necessary. Concerns for unknown resources, which might be discovered during mining have been made conditions of the permit.

18. The US Fish and Wildlife Service (FWS) provided comments dated November 4, 2009. Based on a field study conducted by L.J. Davenport dated October 6, 2009, the FWS expressed concerns over impacts to several federally listed species or critical habitat as defined by the Endangered Species Act known to occur near the proposed permit area. The Alabama Department of Conservation and Natural Resources provided comments dated September 23, 2009 indicating sensitive species were known to occur within 0.1 miles of the proposed permit area. Additional information submitted by the applicant to the FWS resulted in a letter dated March 5, 2010 finding that reduction in mine area, proposed BMP's and a minimum 200' vegetated buffer between the mine site and the Cahaba River would be adequate to avoid impacts to these species. The US Army Corps of Engineers issued authorization under Nationwide Permit 21 SAM-2008-01445-CJH dated May 29, 2009 for activities under this permit, which will impact 832 feet of stream. A mitigation plan approved by the Corps was reviewed by ASMC and found to be consistent with the provisions of this permit. This permit was issued to Hope Coal Company, Inc., and was transferred to Tacoa Minerals on November 9, 2009. The Corps also issued Nationwide Permit 49 SAM-2010-00376-CTM dated March 24, 2010 for impacts to 3066 linear feet of ephemeral stream (approximately 0.05 acres). A mitigation plan approved by the Corps was reviewed by ASMC and found to be consistent with the provisions of this permit. The ASMC finds that the proposed operation will not jeopardize the continued existence of endangered or threatened species or critical habitat thereof.

19. The proposed permit area is:

(a) Not within an area under study or administrative proceedings under a petition, filed pursuant to Chapter 880-X-7 to have an area designated as unsuitable for surface coal mining operations;

(b) Not within an area designated as unsuitable for mining pursuant to Chapter 880-X-7 or subject to the prohibitions or limitations of Section 880-X-7B-.06 and Section 880-X-7B-.07 of this chapter.

BASED ON THESE FINDINGS I RECOMMEND THAT THIS PERMIT BE ISSUED.

DATE: JUNE 4, 2010

Fred Orange, Permit Manager

/ns

20. **CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT**

Permit Number P3943 **NPDES AL0076295**
NPDES AL0079511
Tacoa Minerals, LLC **Piper Mine**

As required under Federal Public Law 95-87, Section 510(b)(3), the Alabama Surface Mining Commission (ASMC) must find in writing the following proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area. The applicant must submit a determination of probable hydrologic consequences of mining and reclamation operations in Part II.H of the permit application for areas both on and off the mine site. This determination will allow the ASMC to assess probable cumulative impacts of all anticipated mining activities on the surface and ground water hydrology of the permit and adjacent areas as stated in Federal Public Law 95-87, Section 507(b)(11) and ASMC Rule 880-X-8E-.06 (1)(g). The following assessment and findings are intended to fulfill the above.

I. GENERAL INFORMATION

The proposed Tacoa Minerals, LLC ASMC permit P-3943, Piper Mine, is for a highwall mining operation. This mine site will encompass approximately 285 acres in northeastern Bibb County, south of Marvel. The proposed mine site is located in parts of Sections 13, 14 and 23, Township 22 South, Range 5 West, Bibb County, Alabama as seen from the Halfmile Shoals and West Blocton East Quadrangles.

The mine site is bound down the west side by the Cahaba River, to the north by Black Creek, to the south by an unnamed tributary to the Cahaba River, and to the east by a Jeep trail.

Historical Coal Mines

Approximately 195 acres of the permit area is pre-law surface mining consisting of abandoned highwalls, pits and spoil areas without reclamation. Approximately 1.7 miles southeast of the southern most increment is the Little Cahaba Coal Co. underground mine in the Thompson Seam.

II. CUMULATIVE IMPACT AREA (CIA)

The Cumulative Impact Area (CIA) is that area, including the permit area, within which impacts resulting from the proposed operation may interact with the hydrologic impacts of all other past, current and anticipated coal mining on the surface and groundwater systems.

The CIA for surface water for Permit P-3943 has been defined as the proposed permit area including Black Creek, Daley Creek, unnamed tributaries to the Cahaba River and the Cahaba River. See Map No. 1 for the surface water CIA.

The CIA for groundwater for this permit is limited to the permit area itself. The CIA has been selected based upon the Department's assessment of the possible hydrologic impacts, which may occur as a result of mining operations. The subsurface hydrologic components considered in this assessment include all significant water-bearing units in, and within the vicinity of, the proposed permit. No cumulative impacts to groundwater are expected due the dip of the strata and the lack of a widespread, regional aquifer system. See Map No. 1.

A. Active or Proposed Mines

There are no known proposed mines in the area at this time. The Tacoa Minerals LLC Seymour Mine, ASMC permit P-3855, is located east of the permit area. See map No. 2 for the location.

B. Geologic/Hydrogeologic Information

i. Geology

The proposed P-3943 permit area is located in the Cahaba Coal Field of the Valley and Ridge Province. This section of Bibb County consists of the Birmingham-Big Canoe Valley, Cahaba Ridges, and Cahaba Valley districts. Cambrian to Pennsylvanian aged sedimentary rocks crop out in northern Bibb County, and the Pennsylvanian aged rocks include the Pottsville Formation.

The Pottsville Formation consists mostly of alternating beds of sandstone, conglomerate, siltstone and shale with beds of coal and underclay. The thickness of this unit averages 4,500 feet, and in the eastern part is about 9,000 feet. The coal seams in this group are regionally discontinuous.

According to 'Depositional Settings of the Pottsville Formation in the Black Warrior Basin' the depositional environment of the coal and strata has a direct bearing on the character of the coal seams, that the thickness and extent of the seam is largely determined by the relief of the surface on which the coal swamp developed, and that the nature of the sediments which overlie the coal (overburden) have a strong influence on coal quality including sulfur and trace element content.

Locally, the strata which outcrops in the immediate vicinity of the Piper Mine site includes the Pennsylvanian aged Pottsville Formation, which includes sandstones, shales, siltstones, clays and coal seams. The Clark, Coke,

Atkins, Alice and Jones seams are the only mineable coal seam by highwall methods within the proposed permit area.

ii. Potentially Acid- and Toxic-Forming Materials

Overburden analysis was conducted on one overburden sample within the permit area. Also, eight spoil samples were run to characterize the material that will be used to backfill the highwalls. The analysis was run to determine the potential for acid- and toxic-forming properties. Potentially acid- and toxic-forming materials are those that exhibit a pH of less than 4.0 s.u. or a deficiency in calcium carbonate equivalent of at least 0.0 tons per 1,000 tons of material (T/KT). Samples were collected every 5 feet or change in lithology and analyzed for pH (paste), total sulfur, potential acidity, neutralization potential and fizz rating.

C. Surface Water

The proposed permit area is located in the Cahaba River Basin and is drained by the Cahaba River, unnamed tributaries to the Cahaba River, Daley Creek and Black Creek. The USGS Hydrologic Unit Code from the Alabama Soil and Water Conservation Committee (as of 2008) for the area is 003150202-070.

The Valley and Ridge province is characterized by parallel valleys and alternating ridges of resistant rock. The Cahaba River drains the area. The Cahaba River drains the Cahaba Coal Field, the pre-Pennsylvanian rocks east of the Cahaba Coal Field, and the eastern part of the pre-Pennsylvanian rocks west of the coalfield. Its drainage also includes part of the industrial, municipal and urban area of Birmingham. The Cahaba River drains to the Alabama River, which ultimately reaches the Mobile River, which flows to the Gulf of Mexico.

To characterize the existing quality and quantity of water within the above-mentioned streams, baseline data was obtained and submitted in the permit application for Tacoa Minerals, LLC Inc. P-3943. Sample data was submitted from three sample sites. Sample Site 02423647 is downstream on the Cahaba River and drains 378878.5 acres (592 mi^2). Site SW-2 is downstream on an unnamed tributary to the Cahaba River and drains approximately 1471 acres (2.3 mi^2). Site SW-3 is downstream on Black Creek and drains approximately 2560 acres (4.0mi^2). See Table 1 for surface water baseline information.

Post-Mining water quality and quantity estimates are based on several factors:

1. Baseline surface water quality
2. Estimated impact during mining
3. Size of the permit area compared to the impacted watershed

4. Amount of previous mining within the watershed

Table 2 at the end of this assessment shows the post mining water quality projections. Map No. 2 shows adjacent permits and Map No. 3 shows the cumulative adjacent permits and associated sub-watersheds within the vicinity of the proposed permit.

Thirteen sediment control structures are proposed for this mining operation. At this time the basins are proposed as temporary impoundments. If during the life of the mine any or all of the basins are proposed to become permanent, qualifying data will be submitted for review.

D. Ground Water

According to Geohydrology and Susceptibility of Major Aquifers to Surface Water Contamination in Alabama; Area 7; USGS Water Investigations Report 87-4109, generally aquifers in the northern part of the study area are in Paleozoic limestone and dolomite formations, however this is not the case for this permit area. There was not shown any limestone or dolomite during the drilling of this permit. It appears by drilling that groundwater within the permit area is contained in the poorly connected fracture system of alternating sequences of sandstone and shales associated with the Pottsville Formation. According to this same publication, the portion of Bibb County where the permit is located consists of the Pottsville Formation. This can be seen in Figure 2, from Report 87-4109 at the end of this report.

According to Geohydrology and Susceptibility of Major Aquifers to Surface Water Contamination in Alabama; Area 3; USGS Water Investigations Report 88-4120, which discusses the Pottsville aquifer in greater detail, groundwater in the Warrior Basin occurs in fractures and along bedding planes in the Pottsville Formation. The sandstone beds within 250 to 350 ft. of the surface generally contain the most productive water-bearing openings. Regionally, the primary source of recharge to groundwater is rainfall, which averages 54 inches per year. The Pottsville aquifer is tightly cemented and has small primary porosity and permeability, and the yields of public water for wells completed in this aquifer are less than 0.15 Mgal/d (million gallons per day). This aquifer is also commonly high in iron.

Groundwater movement is generally from areas of higher elevation, along bedding planes, toward stream channels. Where the groundwater level intersects the stream channels, groundwater discharges into the stream and contributes to surface runoff as baseflow. Groundwater movement near the Piper Mine is believed to be in the dip direction, southeast, away from the Cahaba River.

Domestic Wells

McGehee Engineering Corp. conducted a well inventory of the Piper Mine. The inventory showed no residences within a ½ mile radius of the permit area.

Company Installed Wells

During drilling of the overburden hole and exploration holes at this mine, no horizons were observed to produce water in usable quantities. Also with the steep dip of the strata and confining units more vertical, horizontal movement of groundwater across the strata is unlikely. If water were encountered in a well, it would be in a hydraulically isolated aquifer incapable of large quantities of water and a fast recharge.

At this site there is a groundwater-monitoring waiver due to the dip of the coal (away from the Cahaba River), the lack of local groundwater users and the low potential of future groundwater availability.

There are no known wellhead protection zones or public water supply wells in or within 1,000 feet of the proposed permit area.

E. Coal Processing Waste

Coal processing waste (gob and slurry) will not be generated or disposed of at the site.

F. Material Damages

With respect to the CHIA, material damage to the hydrologic balance means the changes to the hydrologic balance caused by surface mining and reclamation operations to the extent that these changes would significantly affect present and potential uses as designated by the regulatory authority. This includes the hydrologic impact that results from the cumulation of flows from all coal mining sites in a cumulative impact area. Examples of material damage are: permanent destruction of a major regional aquifer; temporary contamination of an aquifer in use that cannot be mitigated; and solute contributions to streams above receiving stream standards.

A CHIA is based on the best currently available data and is a prediction of mining-related impacts to the hydrologic balance. Permittees (and permit applicants) are required to monitor water quality and quantity. Exceeding material damage thresholds might also cause significant reduction of the capability of an area to support aquatic life, livestock and wildlife communities.

III. FINDINGS

Based on the information presented above, the following findings have been made relative to the proposed permit area.

A. Historical Coal Mines

With regard to the historical surface mines in, and within the vicinity of, the proposed site, the possible cumulative effect of the previous mining along with the proposed operations on surface and ground water quality/quantity will be discussed in detail in the following Surface Water and Ground Water sections.

B. Potentially Acid- and Toxic-Forming Materials

Laboratory analyses of the bedrock overlying, and immediately below the Clark Seam show that the overburden at the Piper Mine contains 6514 excess tons/acre of neutralization potential; a neutralization potential of +18.2882, and an acid-base account of +12.3691 (tons $CaCO_3$/1000 tons overburden). It should be noted that an acid base account is not a water quality prediction tool, but instead is used to support the ability of vegetation to be established and supported. According to the "Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania" publication by the Pennsylvania Department of Environmental Protection, excess neutralization potential most likely produces alkaline drainage.

Eight spoil samples were run for neutralization potential and acid-base account also. This material will be used for backfill. The results show a low sulfur content, and marginal neutralization potential. This material has been weathered, and as such is chemically inert. While it may hold only a small amount of neutralization potential, there is no indication that it will cause any acid mine drainage.

C. Surface Water

Laboratory analyses of the samples collected from the Cahaba River reveal minimal impact from previous mining of the watershed at this location. Sulfates and conductance are indicative of minimal disturbance. The samples from an unnamed tributary to the Cahaba River and Black Creek show similar water chemistry. There is one instance of high conductance at all three surface water sites on the same date in November of 2008. It is not known why this high conductance occurred on this day. According to the Alabama Department of Environmental Management the receiving streams' use classification is 'Fish and Wildlife'.

Baseline water quality at Piper Mine shows neutral to alkaline pH, low iron, low manganese, low sulfates, low conductivity and low suspended solids, varying on the discharge at the time of sample.

The proposed mining operations will utilize improved management practices and techniques that were not employed during the historical mining operations. Changes in the quantity and quality of the waters in the streams draining the site are expected to be minimal due to the proposed mining activities. During mining, runoff from the disturbed areas will be diverted into sediment basins that are designed to retain all settleable solids, skim and retain all floating solids, and provide adequate detention volume and time to minimize the contribution of suspended solids and dissolved solids into the receiving streams. Effluent from the sediment basins will be monitored by the permittee in accordance with National Pollution Discharge Elimination System (NPDES) permit requirements issued by the Alabama Department of Environmental Management. The effluent will be chemically treated, if necessary, in accordance with the NPDES permit. The basins will be monitored quarterly through final bond release in order to characterize and document any effects the mining may have on the surface-water hydrologic balance.

The Critical Point site that will be used for this permit is the Surface Water Monitoring Site 2423647 downstream on an the Cahaba River. The Critical Point evaluation was used to determine the new concentration of Conductivity at this point, and compared to the water quality projections. Based on the equation:

$$C_{nc} = \frac{Q_a C_a + Q_c[(A_c - A_a)/A_c] C_g}{Q_a + Q_c[(A_c - A_a)/A_c]}$$

Where:
C_{nc} = new concentration at the critical point,
C_g = concentration from the general area,
C_a = concentration from the anticipated mine area,
A_c = drainage area above the critical point
A_a = anticipated mine area in the drainage basin,
Q_a= average flow from the anticipated mining area in the drainage basin, and
Q_c = average flow at the critical point

Using current monitoring data at the Critical Point and the information from the water quality and quantity projections, the new concentration of Conductance at the Critical Site 2423647 is anticipated to be 374.7 μmhos/cm.

Once mining has begun, the applicant will continue to sample and monitor downstream and upstream on the Cahaba River, an unnamed tributary to the Cahaba River and Black Creek. These sites will be used to characterize and document any effects the mining may have on the surface-water hydrologic balance.

Water data from the adjacent Tacoa Minerals, LLC ASMC permit P-3855 Seymour Mine can be useful to predict the hydrologic impacts from this mining operation. This adjacent mine also is using highwall mining and has historically shown compliance with NPDES discharge limits.

D. Ground Water

The proposed operations are not expected to have a permanent adverse impact on the overall quality of the ground water at the site or surroundings. No long-term impact is anticipated.

No bedrock strata will be excavated during this operation. However, improved mining and management practices/techniques and contemporaneous reclamation should result in less water quality issues as compared to the historical mining. Should any increase in mineralization occur in the ground water as a result of the proposed activities, it is anticipated the levels will diminish and return to pre-mining concentrations once mining and reclamation activities are complete. Ground water will be further protected by properly abandoning and sealing all drill holes completed at the site (with the exception of blast holes) that will not be used for monitoring purposes.

IV. CONCLUSION

The assessment of probable cumulative impacts of the Tacoa Minerals, LLC Piper Mine (P-3943) finds the proposed operations have been designed to prevent material damage to the hydrologic balance outside the proposed permit area.

Table 1
Ranges/Averages of Surface-Water Quality/Quantity
Stream Points
P-3943

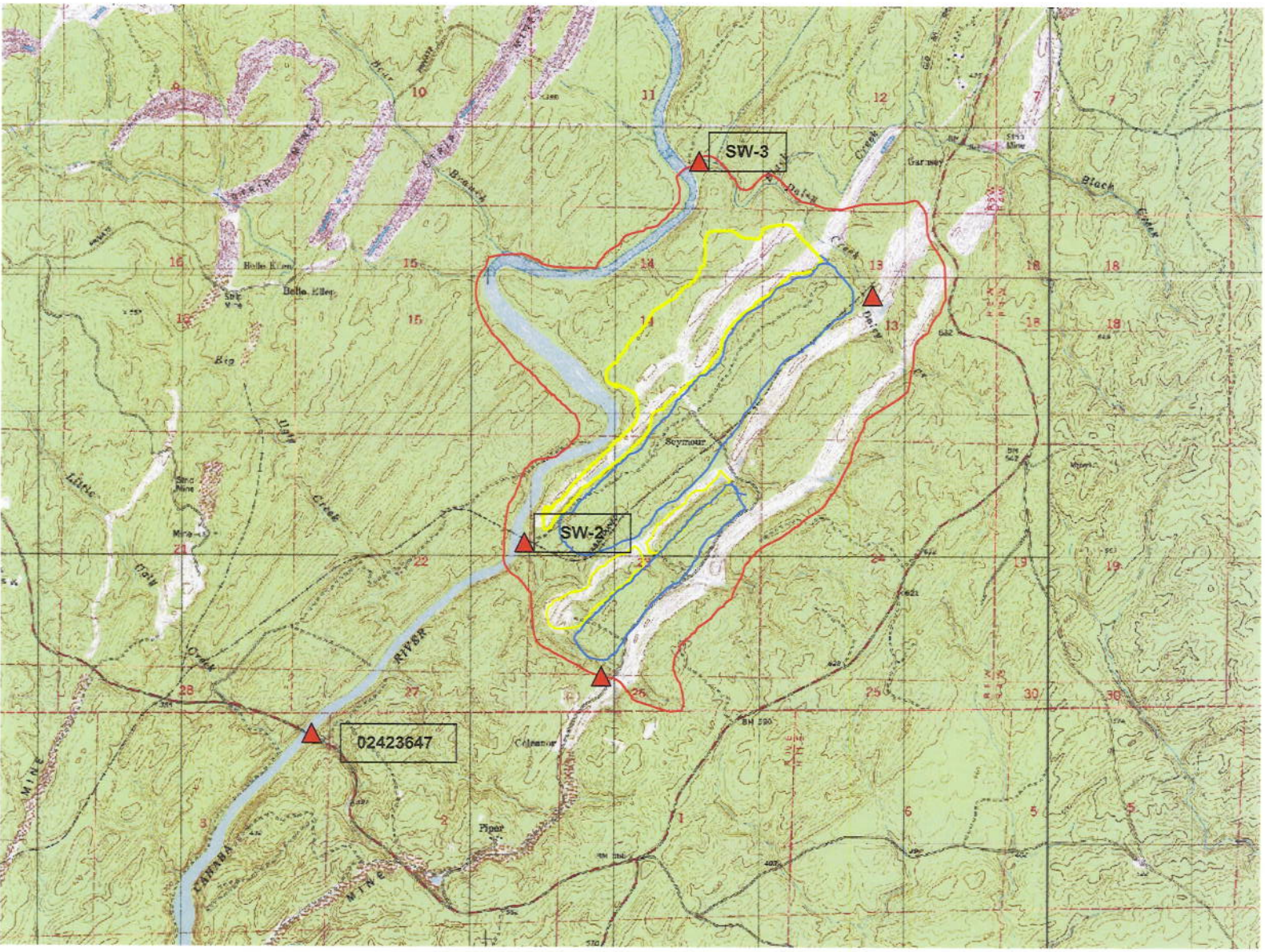
Parameter	02423647 DS Cahaba River	SW-2 DS UT to Cahaba River	SW-3 DS Black Creek
Discharge Rate (cfs)	0.2914 – 618.121 (119.8385)	0.4781 – 12.75 (4.7065)	0.2129 – 0.4857 (0.42)
Field pH (s. u.)	6.56 – 8.62 (6.98)	6.68 – 8.75 (7.17)	6.56 – 9.58 (7.06)
Specific Conductance (u-mhos/cm)	169 - 1267 (559.5)	142.8 - 1267 (575.7)	118 - 1009 (474.3)
Total Suspended Solids (mg/l)	3 - 8 (5)	1 - 18 (5)	1 - 7 (5)
Total Iron (mg/l)	0.08 – 2.51 (0.45)	0.09 – 0.21 (0.18)	0.09 – 0.39 (0.16)
Total Manganese (mg/l)	0.03 – 0.75 (0.31)	0.03 – 0.14 (0.05)	0.03 (0.03)
Sulfates (mg/l)	30 - 111 (49.7)	36 - 105 (59.3)	29 - 92 (45.7)
Acidity (mg/l)	0 - 29 (8.33)	0 - 22 (13)	0 - 80 (20.7)
Alkalinity (mg/l)	78 - 162 (113.7)	78 - 162 (77.7)	16 - 118 (78.7)

Average values are set in parentheses (with the exception of pH).
Averages calculated as geometric means.
DS: downstream
US: upstream
UT: unnamed tributary

Table 2
Post Mining Water Quality Estimates for Surface Water
Average Flow
P-3943

Parameter	02423647
pH (s. u.)	7.17
Total Suspended Solids (mg/l)	3
Total Iron (mg/l)	0.31
Total Manganese (mg/l)	0.05
Specific Conductance (u-mhos/cm)	351

Map No. 1
P-3943
Tacoa Minerals, LLC
Piper Mine



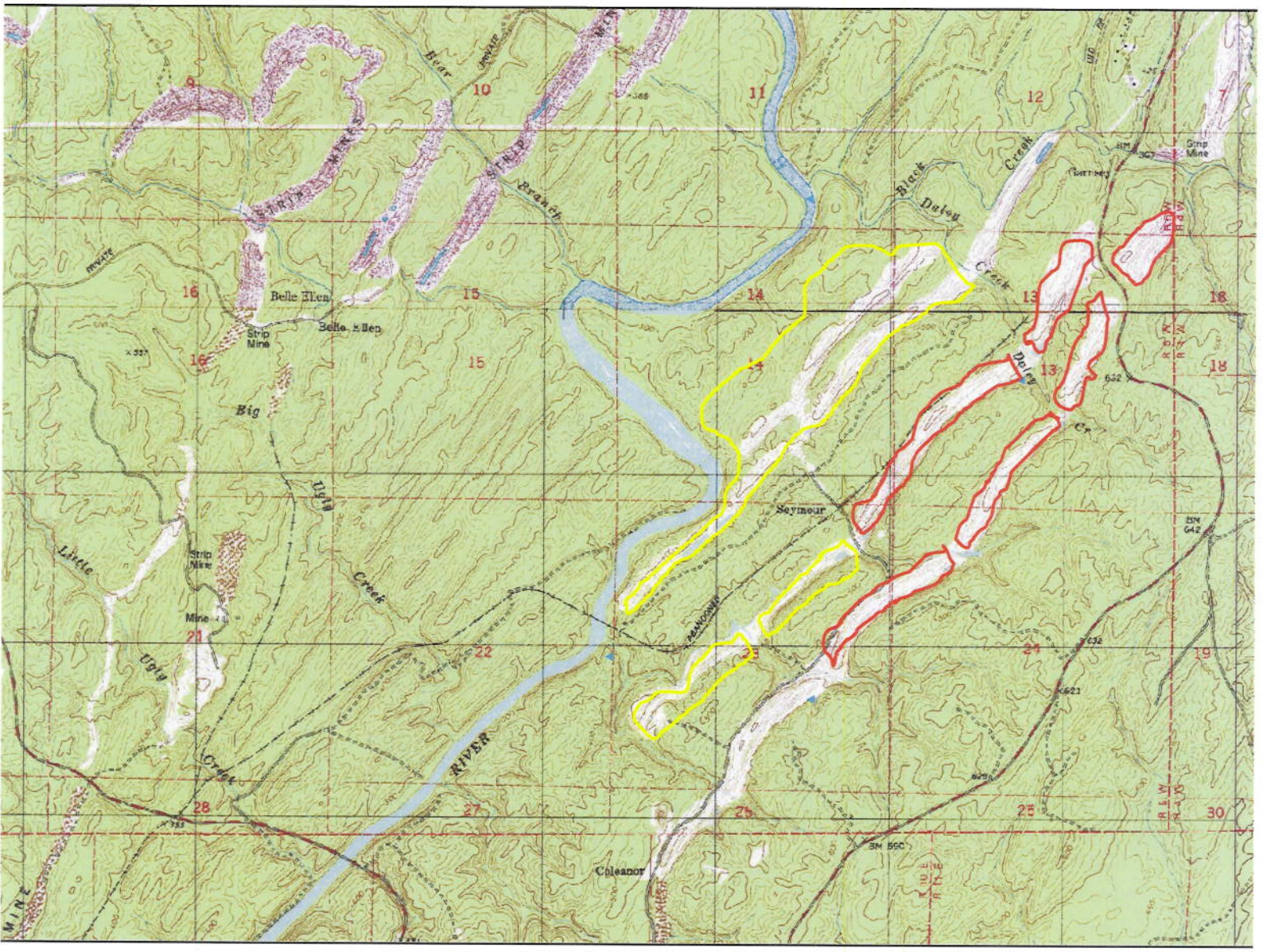
Approximate Permit Boundary

Surface Water CIA

Groundwater CIA

Surface Water Monitoring Sites

Map No. 2
P-3943
Adjacent Permits



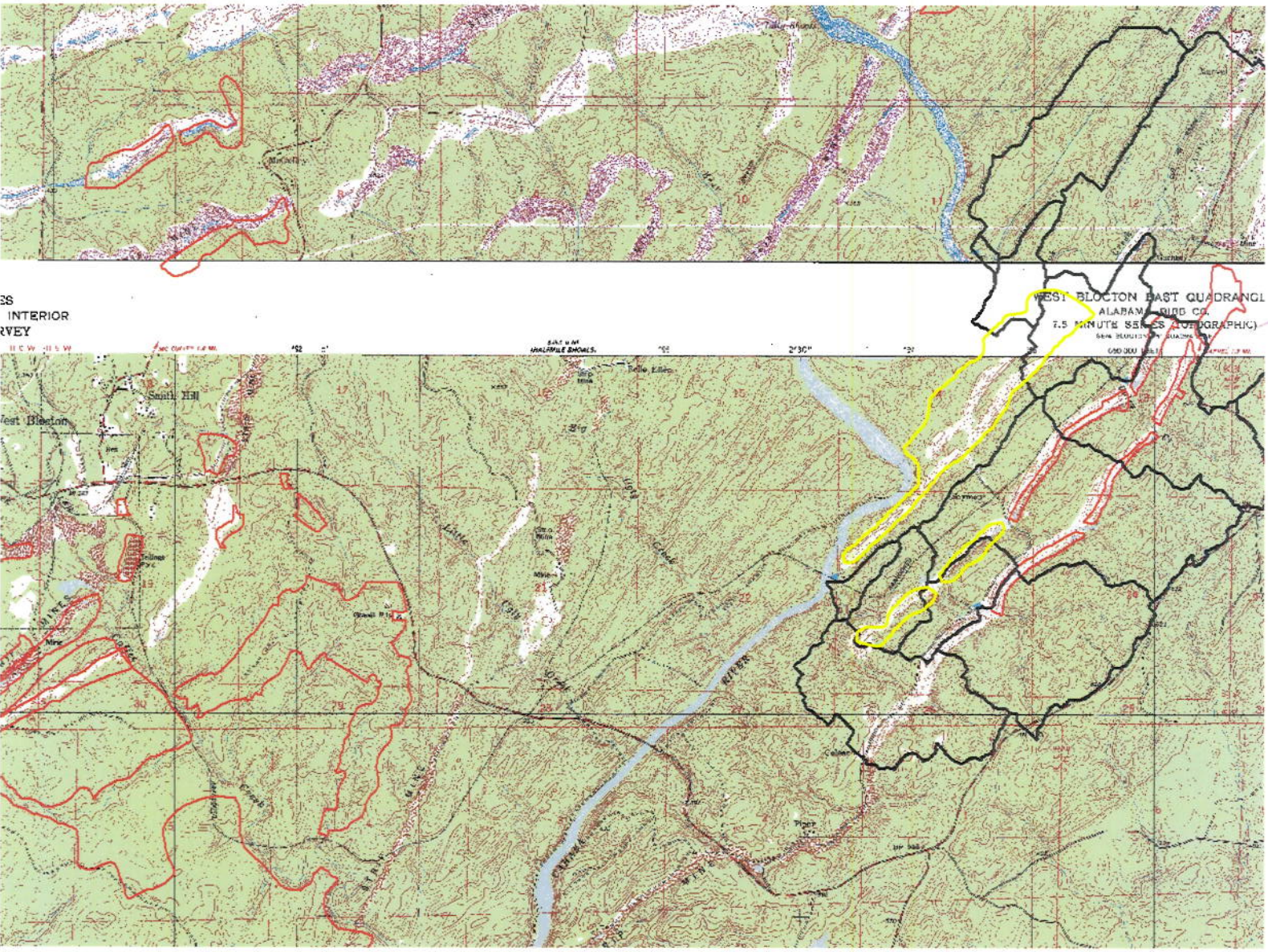
West Blocton East and Halfmile Shoals Quadrangles

Approximate Permit Area P-3943

Tacoa Minerals P-3855

↑ N

Map No. 3
P-3943
Cumulative Adjacent Permits with Sub-Watersheds



West Blocton East and Halfmile Shoals Quadrangles

Approximate Permit Area

Adjacent Permits

Cumulative Sub-watershed Delineation

↑ N

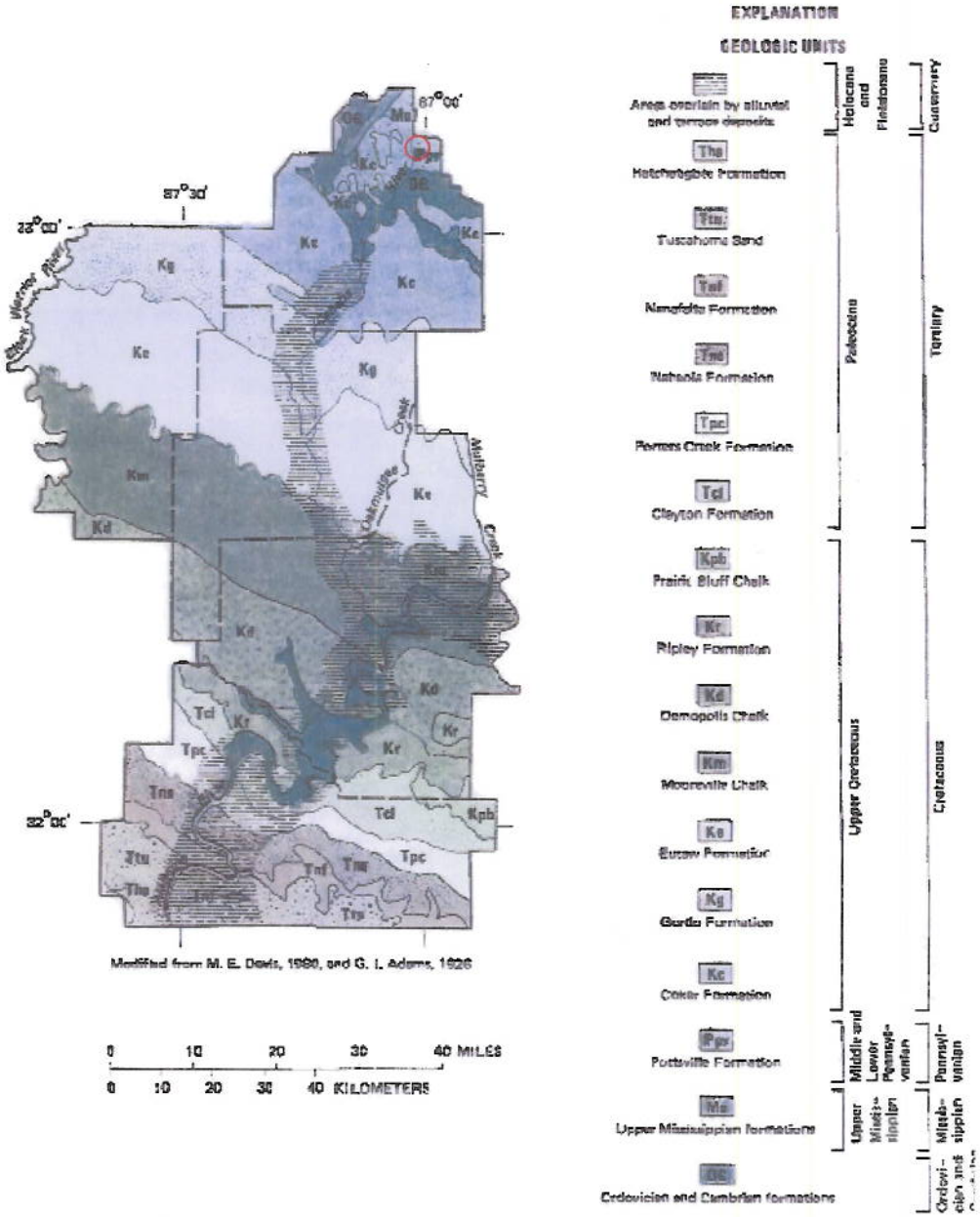


Figure 2.--Generalized geology of the study area.

7

Figure 2 From Report 87-4109

○ Approximate Permit Area